to suffice by themselves and therefore would transfer bubble bits in all platelets or all Z levels at this particular X and Y coordinate. To select the desired Z platelet the third conductor is energized with a coincident inhibit pulse of opposite polarity to that used in its parallel conductor as shown in FIG. **11** in the X direction. THIS IS DONE IN ALL Z PLATELETS EXCEPT THE ADDRESSED ONE. In this manner a unique address can be selected by the three coordinate input signals.

In order to obtain magneto resistive read-out from such a three dimensional array, it is preferred to use the third conductor or triad spacing shown in FIG. **12** wherein the space corresponding to that occupied by the enable conductor **43** in the X array is occupied in the Y array by the conductor **47**, having a magneto resistive sensing element **48** positioned in the gap of the loop **46***a* of conductor **46**. Conductors **47** in the Y set are brought out to conductor **16** for particularized bit location read-out in a manner to be discussed below.

It will be noted that the single loop conductor **45** of FIG. **12** is the mirror image of conductor **41** rotated by 90°, whereas the double loop conductor **46** of FIG. **12** is the mirror image of drive conductor **42** rotated by 90°.

In FIG. **11** conductor **41** feeds loop **41***a* which provides the store 0 of the underlying bubble. Conductor **42** feeds the reversing loop having portions **42***a* and **42***b*, which provides the store **1** and the interrogate 1 positions of the bubble. Conductor **43**, as noted above provides the enable or inhibit function.

In FIG. **12** conductor **45** feeds the single loop **45***a* which provides the other drive circuit for the store 0 position. conductor **46** feeds the two loops **46***a* and **46***b* of the reversing loop at each bit location. Loop **46***a* provides the other half of the drive circuitry for the store 1 position, whereas loop **46***b* provides the other half of the drive circuitry for the interrogate position. Conductor **47** is attached to the magneto resistive sensor **48** and detects the presence or absence of a bubble in the 1 position. Direct magnetic flux coupling between the conductor driving loop and the magneto resistive sensor is minimized by locating the sensor in the gap in the loop **46***a*.

In operation, the bipolar "half current" pulse in the conductor **46** and quarter current pulses in conductors **42** and **43** transfers a bubble stored at the 1 position under loop **46**a to the interrogate position under loop **46**b and returns it. The conductor arrays are so interconnected that a three ordinate input signal supplies current only to the specified X and Y conductors of every Z plane and supplies current to all of the enable-inhibit conductors of the specified Z plane.

The bubble excursion to the read portion is sensed by the magneto-resistor sensor **48** which is part of a series string of all magneto-resistor sensors contained in this particular Y matrix. Only one sensor is needed for each matrix element, since the address of the interrogated bubble is given by the coordinates of the bipolar interrogating pulse which are supplied by the control circuits **14** not only to the drive circuits but also to the utilization circuit. To enhance the output signal of the string of magneto-resistor sensors due to transfer of a bubble it is desirable to subdivide the sensor string into groups and detect the transfer site either by sequential scanning or by parallel comparison.

This arrangement thus makes possible the use of the third conductor position in the X array for the enable or inhibit function described above. If such a function is not desired, this position in the X array may alternatively be used as a redundant detector array for increased reliability.

Of course, it is possible to insert separate sense amplifiers into each column and row of magnetoresistors and thus detect the location of a bubble independently of the interrogating pulse coordinates. However, such a scheme would be very costly due to the number of sense amplifiers required. A typical simple fabrication process for the array illustrated in FIGS. **11** and **12** consist of depositing a 250 angstrom thick permalloy magneto-resistor film layer over the whole insulating substrate of one of the glass plates. This layer also serves as a bond between the heavy conductor gold layer deposited to form a drive conductor and the substrate. Next, the negative photoresist pattern of all conductors is formed and gold is evaporated and plated through the resultant photoresist apertures. The undesired permalloy material remaining is then etched. Thus, very few process steps are needed for the manufacture of this device which can be produced economically and reliably.

There is thus provided a three ordinate input signal addressable random access non-destructive read-out memory device wherein each crystal platelet of a three dimensional stack of platelets requires only two conductor array or sets in order to provide both the read and write functions for each bit location in the crystal platelet and in which the reliability, economy and density of packing of the memory are increased by the fact that no two conductors of any set cross each other thereby eliminating the need for insulated crossovers.

What is claimed is:

1. In a random access memory device of the type utilizing cylindrical magnetic domains movable in a plane parallel to a major surface of at least one crystal platelet and having a domain positioning magnetic field generating array of electrical conductors positioned in magnetic field coupled relationship to said crystal platelet to define therein an array of binary bit memory locations each of which can store a representation of a binary zero or a binary one, as represented by a selected positioning of one of said movable magnetic domains at a particular portion of said bit location, the improvement comprising:

a. a first set of electrical conductors comprising a plurality of pairs of conductors all extending in spaced parallel relationship to each other in a first direction in a first plane at one major surface of said crystal platelet;

b. a second set of electrical conductors comprising a plurality of pairs of conductors all extending in spaced parallel relationship to each other in a second direction different from said first direction in a second plane at the major surface of said crystal platelet which is opposite and parallel to said first major surface thereof, one pair of each of said sets of conductors being positioned in magnetic coacting relationship with each of said bit locations and with the pair of conductors in the other set which is positioned to magnetically coact with the same bit location;

c. one conductor of each of said pairs of conductors in each of said sets having at each bit location a re-